

VST Report to ADWG

08/23/12

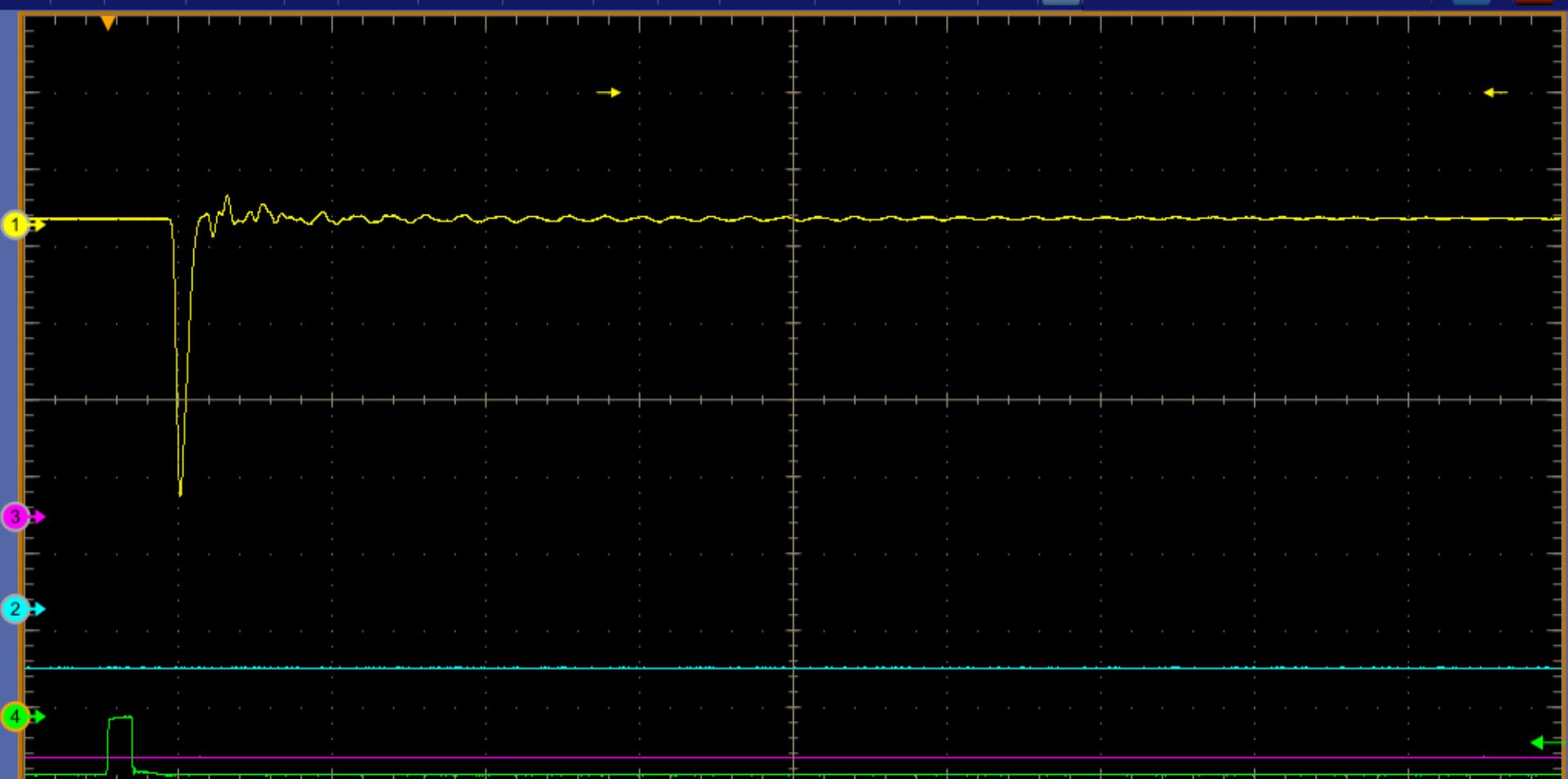
Ben Jones

Activities since last ADWG

- 1. Ringing, noise and crosstalk
- 2. Single PE Calibration
- 3. Cosmic / noise rate measurements
- 4. Light leak hunting

Noise and Crosstalk

- 1. Standalone power supply tested, ringing still present
- 2. Notice crosstalk between channels 1 and 2, which seems to have its origin in the feed through.
 - Crosstalk signal displays ringing behavior – maybe related?
 - Test with PMT in a dark box?

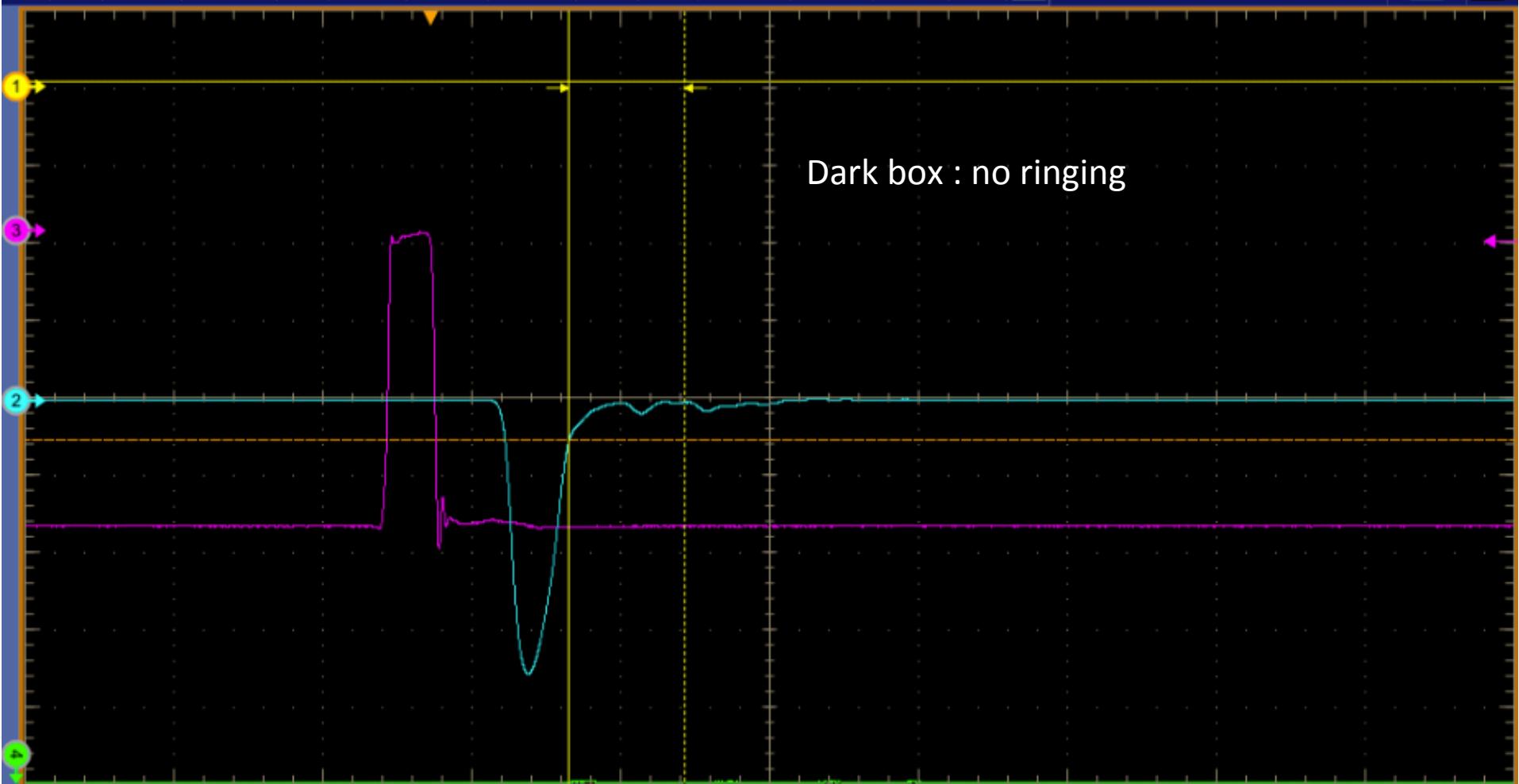


C1 90.0mV/div 50Ω B'W:500M
C2 1.0V/div 50Ω B'W:500M
C3 500mV/div 50Ω B'W:500M
C4 1.0V/div 50Ω B'W:500M

A' C4 ∫ -340mV
Ready Normal

200ns/div 5.0GS/s 200ps/pt
Run Average:100
77 acqs RL:10.0k
Man July 23, 2012 17:13:07

	Value	Mean	Min	Max	St Dev	Count	Info
C1 Area	7.515nVs	7.5145055n	7.515n	7.515n	0.0	1.0	
C2 Area	-871.6nVs	-871.6278n	-871.6n	-871.6n	0.0	1.0	
Hs Mean	102.0ns	101.95928n	100.4n	102.3n	183.4p	81.0	
Hs Std Dev*	11.44ns	11.456731n	11.37n	11.83n	64.94p	81.0	



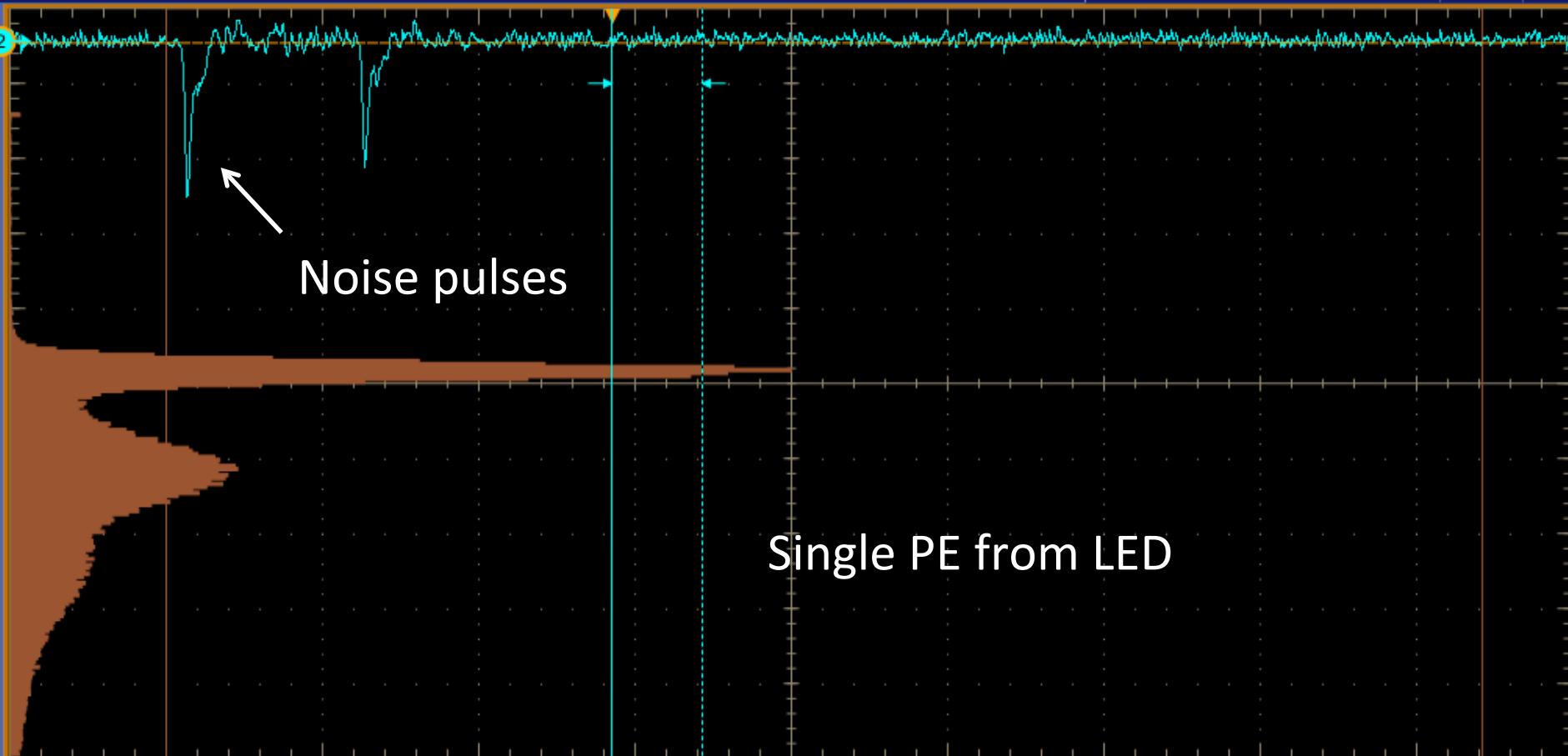
C1	40.0mV/div	50Ω	B _W :500M
C2	1.0V/div	50Ω	B _W :500M
C3	200mV/div	50Ω	B _W :500M
C4	500mV/div	50Ω	B _W :500M

t1	46.1ns
t2	85.1ns
Δt	39.0ns
1/Δt	25.641MHz

A^{*} C3 -28.0mV
Ready Normal

50.0ns/div 2.5GS/s 400ps/pt
Run Average:10000
5 824 acqs RL:1.25k
Auto August 23, 2012 09:42:40

	Value	Mean	Min	Max	St Dev	Count	Info
C1 Area	100.3pVs	100.32131p	100.3p	100.3p	0.0	1.0	
C2 Area	-4.538nVs	-4.5377813n	-4.538n	-4.538n	0.0	1.0	
C2 Low*	-509.7mV	-509.6875m	-509.7m	-509.7m	0.0	1.0	?



C2 6.0mV/div 50Ω BW:500M

t1	-2.0ns
t2	114ns
Δt	116ns
1/Δt	8.621MHz

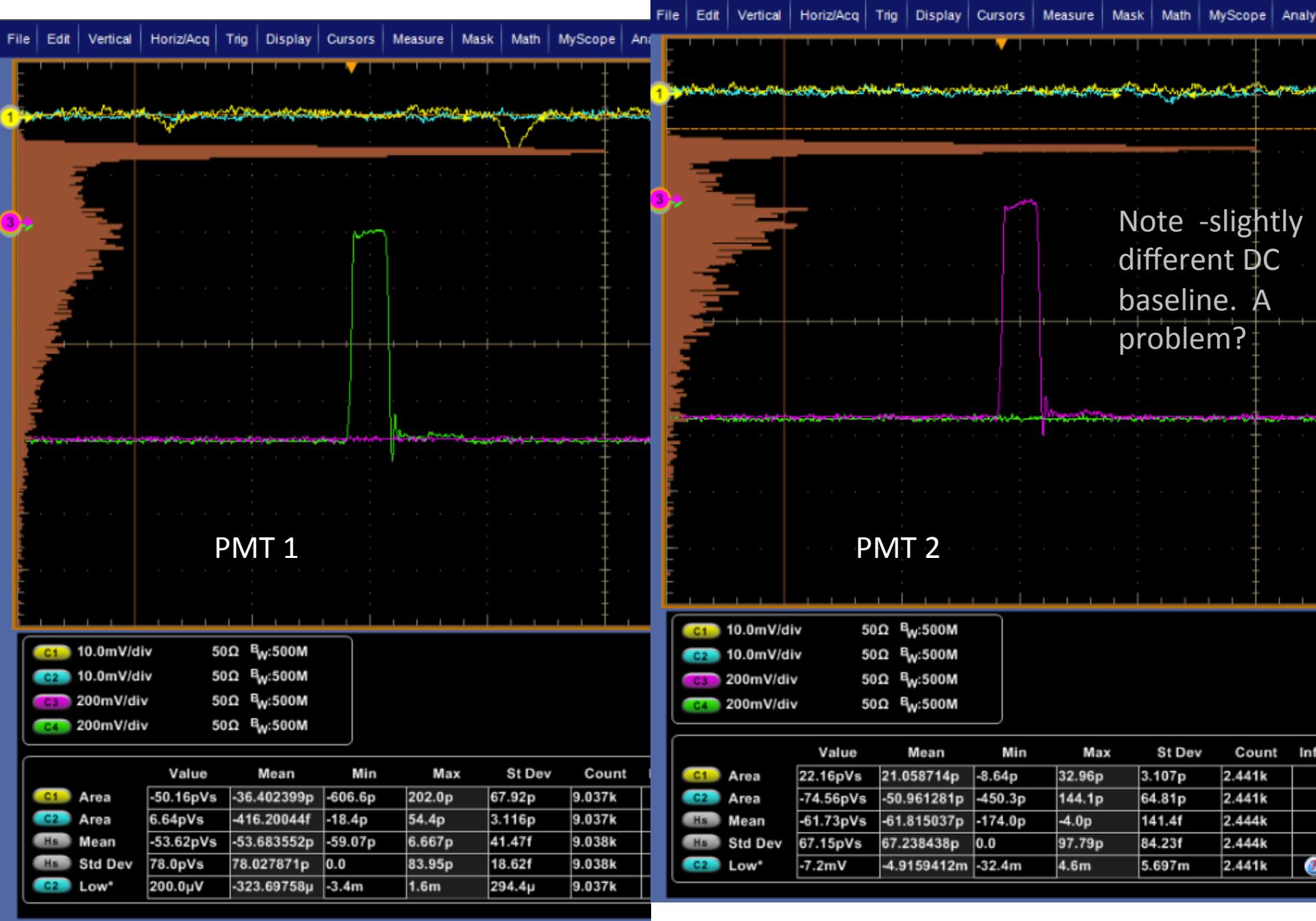
A Aux -250mV
Ready Normal

200ns/div 500MS/s 2.0ns/pt
Run Sample
165 783 acqs RL:1.0k
Auto August 15, 2012 01:01:24

	Value	Mean	Min	Max	St Dev	Count	Info
C1 Area	92.04pVs	90.558514p	-1.519n	1.315n	10.19p	165.8k	
C2 Area	24.24pVs	-114.25098p	-6.709n	361.9p	150.9p	165.8k	
Hs Mean	-96.55pVs	-96.547165p	-233.0p	24.0p	2.573f	165.8k	
Hs Std Dev	122.8pVs	122.7842p	0.0	168.8p	1.576f	165.8k	
C2 Low*	-120.0μV	-8.2164191m	-57.84m	2.88m	8.901m	165.7k	

1PE Calibration

- Size of 1PE measured (in V) 2 ways:
 - Scope only : Poisson shape for large pulse
 - Scope only : Single PE peak position
- Then a known pulse of ~20PE prepared and sent to electronics.
- HV adjusted until this falls in the correct ADC channel
- As verification, #PE in the pulse independently confirmed using poisson stats from the recorded pulses
- Cannot send single PE to readout due to segfault issue



Single PE Sizes (after tuning)

- PMT1:
 - 1PE Method : $1\text{PE} = 76 \text{ pVs}$ $N = 21.4$
 - Poisson Method: $1\text{PE} = 64 \text{ pVs}$ $N = 18.2$
- PMT2:
 - 1PE Method: $1\text{PE} = 67 \text{ pVs}$ $N = 20.1$
 - Poisson Method: $1\text{PE} = 64 \text{ pVs}$ $N = 21.0$
- Gains:
 - PMT1 = 5.9E+6 PMT2 = 5.5E+6

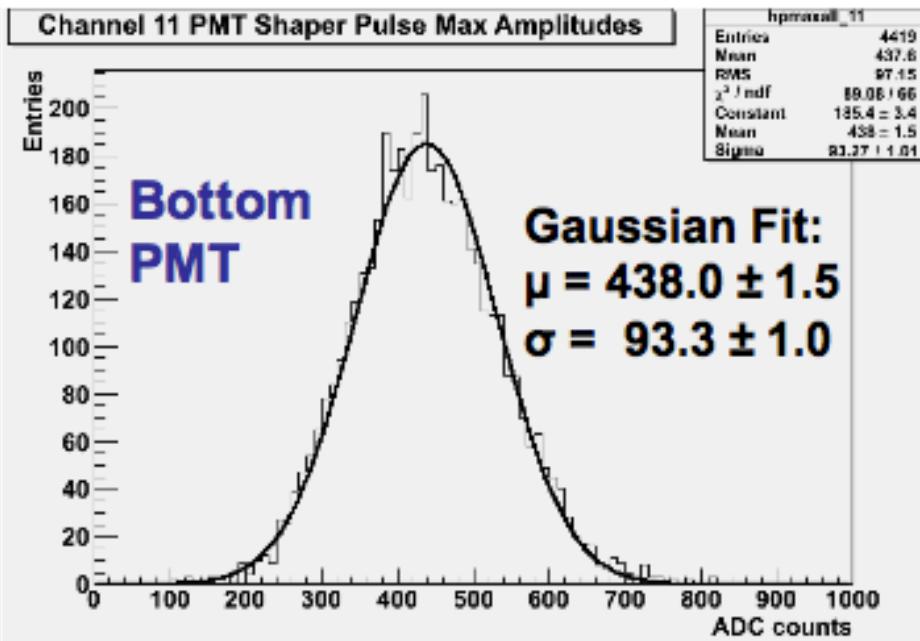
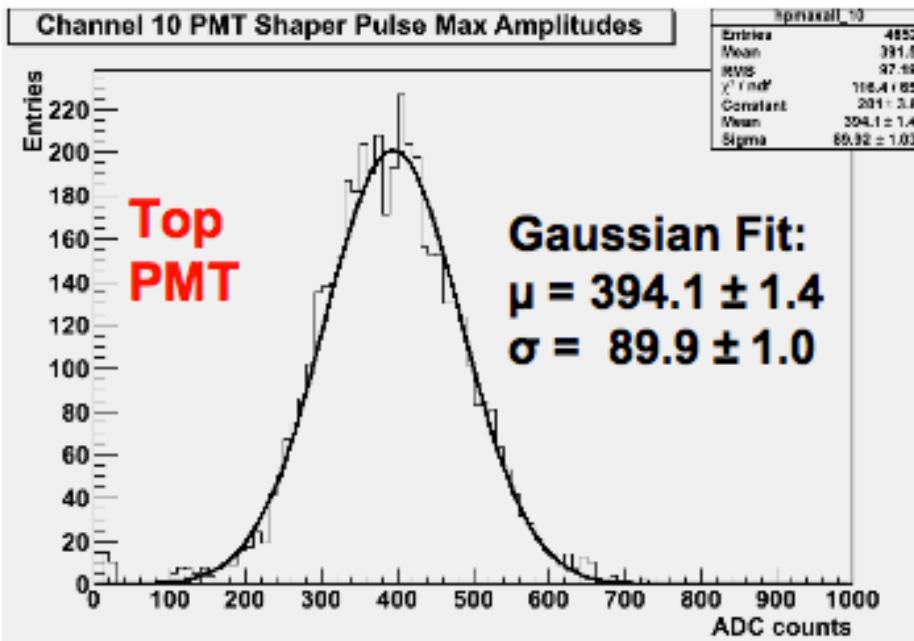
HV Required:

- PMT1: 1080V
- PMT2: 1125V

Bo ADC/PE Calibration

For each LED trigger:

- Apply tight timing cut with respect to expected PMT pulse arrival time
- Histogram the max ADC value for the PMT corresponding to LED that fired



Assuming naïve Poisson statistics: $\mu = kgeN_{pe}$ and $\sigma = kge\sqrt{N_{pe}}$,
where k = charge/ADC conversion, g = gain, and e = electron charge

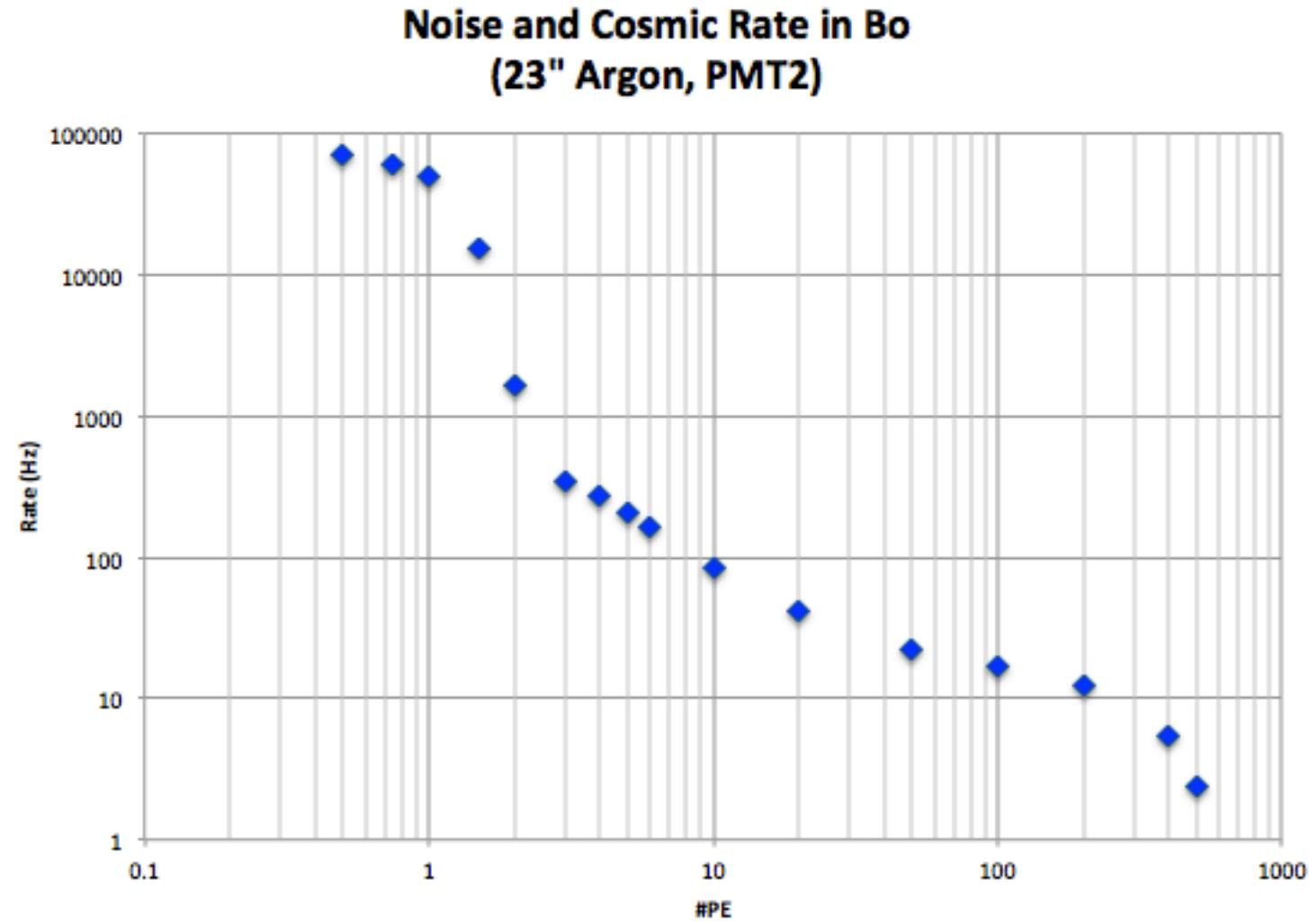
$$N_{pe} = 19.2 \pm 0.3$$

ADC/PE = 20.5 ± 0.3

$$N_{pe} = 22.1 \pm 0.4$$

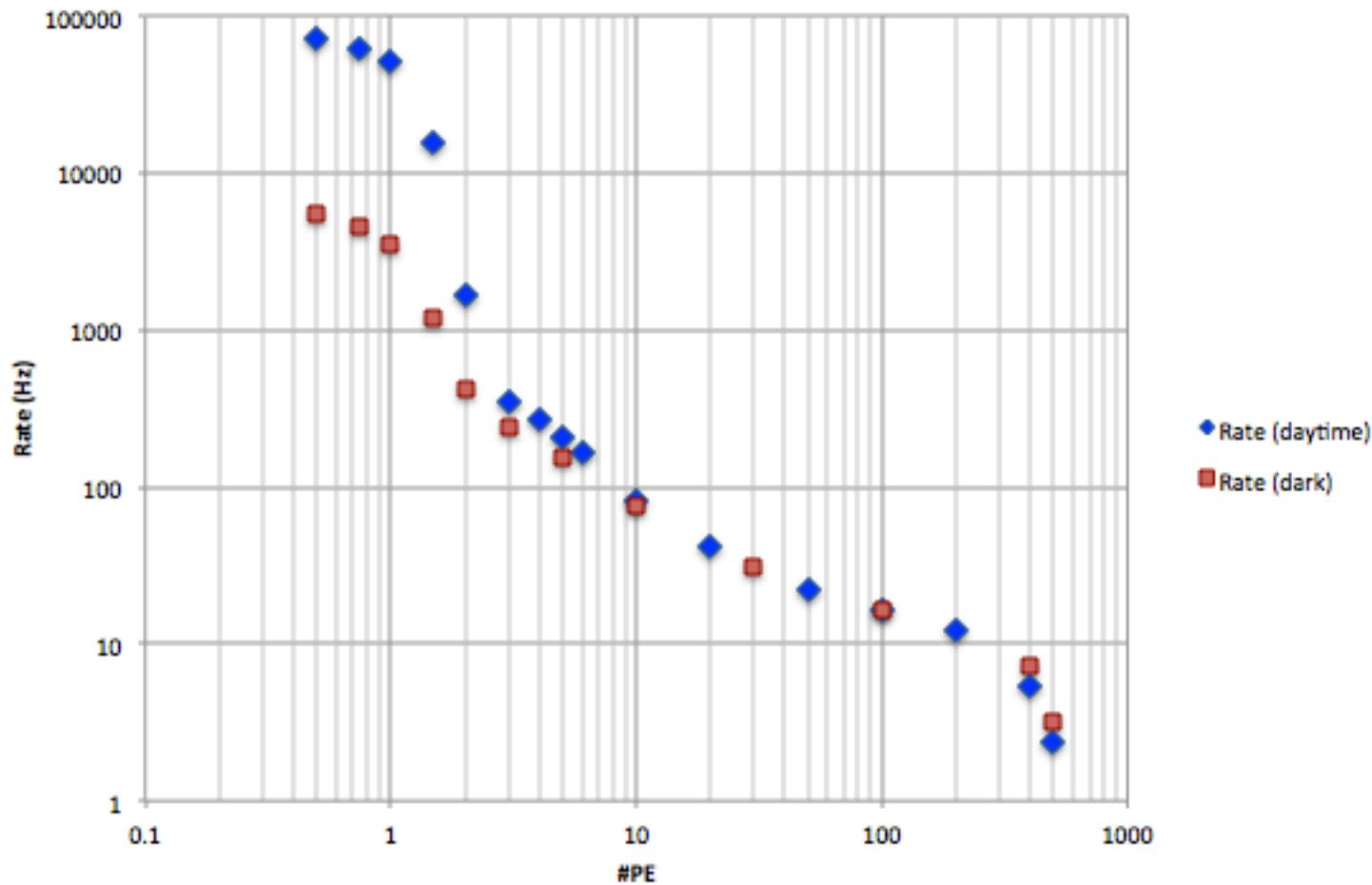
ADC/PE = 19.9 ± 0.3

Cosmic and Noise Rates



Light Leak in 1PE Region

**Noise and Cosmic Rate in Bo
(23" Argon, PMT2)**



Light Leak Search

